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LAND RECLAMATION POLICIES IN THE UNITED STATES.[1]

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CONTENTS.

	Page.		Page.
Past land reclamation policies	3	State land reclamation policies	14
Federal policies	3	General considerations	14
Swamp land acts	3	Irrigation districts	14
Relation of the homestead act to reclamation policies	3	California State land settlement	20
Act of 1866	4	Proposed Federal and State cooperation	23
The desert land act	4	Drainage reclamation	24
Irrigation survey	5	State drainage policies	24
The Carey Act	6	Summary of acreage reclaimed	27
Reclamation act	7	The future of reclamation	34
Irrigation district act	13	Conclusions	40

Land reclamation, strictly speaking, includes the bringing into cultivation of all types of unused land, but the term has come to be limited in common practice to the construction of canals and other works necessary to protection from overflow or the removing of surplus water from wet lands, or to supplying water to dry lands. In popular usage, land provided with these works is reclaimed, although no steps toward putting into cultivation have been taken.

Without regard to the correctness of this use of the word, the lands referred to do form a separate category, and their reclamation involves problems peculiar to this class. Their reclamation is beyond the powers of the owner of a single farm and requires community or corporate action of some kind; and this reclamation must take place in advance of settlement, involving the expenditure of large sums before the lands can be put to use. There are small areas of both wet and dry lands in which it is possible to reclaim single farms, but these areas are so limited that they may be disregarded.

The other classes of land available for the expansion of our farm area—forest and cut-over land requiring clearing only, and open pasture and range land—do not possess these characteristics. These farms may be developed without previous preparation and independently of each other.

[1] The manuscript of this bulletin was examined and recommended for publication by the Committee of Special Advisers on Reclamation appointed by the Secretary of the Interior.

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In this discussion "reclamation" is used in the popular sense, as applying only to the preparing of wet and overflowed land and of dry land, for use for agriculture.

The 1921 Yearbook of the United States Department of Agriculture gives the areas of such lands, as follows:

Reclaimable areas in the United States, 1921.

	Acres.
Irrigable land not now irrigated	30, 000, 000
Wet land requiring drainage only	30, 000, 000
Wet land requiring drainage and clearing	60, 000, 000
Total	[2] 120, 000, 000

The estimate of the area of land that can be reclaimed by irrigation is based on estimates of the water supply within the regions where irrigation is necessary to the growing of crops or practicable as a means of increasing or insuring crop yields. A large part of the land reported as pasture and range land, and of that reported as desert, is susceptible of irrigation so far as its topography and the inherent qualities of the soil are concerned, but it is not within reach of any known water supply. The estimated total of the area that can be irrigated is based upon estimates of the total quantity of water available and of the quantity of water used per acre. Studies made by this department and the State experiment stations show that the quantities of water used in common practice are far in excess of the water requirements of crops, indicating that it is possible to reduce greatly the quantity of water used per acre, and thus increase the total area that can be supplied with water. These studies show also that the law of diminishing returns applies to the use of water in irrigation with peculiar force. That is, when increasing quantities of water are applied to a field the increase in crop is much less than proportional to the increase in the quantity of water. In fact, the point of actual decrease in yield is soon reached. This means that a given quantity of water will produce more crop when applied to a large area than when applied to a small area. As demand for crops increases, the tendency is to use less water per acre, and to irrigate larger areas. It seems likely, therefore, that the area ultimately irrigated will be considerably larger than that given in the 1921 Yearbook.

The estimate of the area that can be reclaimed by drainage is based on more or less accurate measurement and estimates of the area of the land itself, rather than on estimates of other indeterminate factors, as is the case with irrigation. It is probable that this figure is much more accurate than that given for irrigation.

It appears, therefore, that it is possible to increase our present improved area about 25 per cent by reclaiming wet and dry land. This will not represent an absolute increase of 25 per cent in our agricultural production, since most of the land concerned now produces something, chiefly grasses and timber. The irrigation of the arid lands will replace a very extensive type of grazing with a very high type of crop production. Measured by the carrying capacity for animals, it is probable that the productivity will be increased at least a hundredfold. The untimbered wet lands produce in their

[2] Yearbook 1921, p. 430.

present state probably less than the unirrigated arid lands. So far as these two types of land are concerned, their reclamation and cultivation represent an increase in production almost to the full extent of the products grown on the reclaimed land.

The timbered and cut-over wet lands are producing a crop of timber, as well as providing a home for wild life of various kinds. Their reclamation will represent an increase in cropped land at the expense of the timber and game supply. Before such lands are reclaimed very careful consideration should be given to the question whether, considering the cost of reclamation, they are not better employed in growing timber and game. Certainly, giving due consideration to nearness to markets, transportation, etc., in choosing the areas that shall be reclaimed, preference should be given to those areas that are now producing little of value.

This bulletin comprises a discussion of the reclamation policies of the United States, both National and State. Our past and present land reclamation policies are presented as a basis for the discussion of future policies.

PAST LAND RECLAMATION POLICIES.

The past policies with reference to land reclamation are disclosed by the legislation for putting them into force. In the pages that follow Federal policies are discussed first and State policies later.

FEDERAL POLICIES.

Swamp land acts.—Until about the middle of the last century there was such a large supply of unused fertile land in this country that the question of reclaiming wet and arid lands received little attention from either the Federal or State Governments. About 1850 some of the States found it necessary or desirable to pass laws providing for flood protection and reclamation work. (See p. 25.) They found that in reclaiming State or private land they incidentally reclaimed public lands, but had no means of reimbursing themselves. They bore the expense and the Federal Government sold the lands reclaimed and kept the money. This situation was made the basis for legislation granting the public swamp lands to the States within which they were situated.

Such acts were passed in 1849, 1850, and 1860. Under them the public swamp lands within their borders were granted to the following States: Alabama, Arkansas, California, Florida, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Oregon, and Wisconsin. The total area conveyed to the States up to June 30, 1922, was about 64,000,000 acres. A few claims to additional areas are still pending. This granting of the swamp lands to the States explains the absence of any other Federal legislation relating to the reclamation of swamp land. As will be shown later, the policy represented by this act—the removal of obstacles to reclamation by local agencies—has run through all Federal legislation relating to reclamation by irrigation, except the United States reclamation act.

Relation of the homestead act to reclamation policies.—The homestead act (act of 1862) represented a change of policy with reference to the public lands in that it provided that the vacant and unreserved public lands could be obtained by residence thereon rather

than by purchase, a point of view that has dominated our land policy since that time.

When the homestead act was passed the fertile plains of the Mississippi Valley were available for settlement. In large part, these lands were open, grass-covered plains that could be plowed and seeded without "reclamation." When attempts were made to settle the arid lands of the West it was found that some modifications to the homestead plan were necessary if these lands were to be transformed into farms.

An analysis of the various Federal legislative acts dealing with western lands shows a preservation and continuation of the fundamental policy of the homestead act—the creation of farm homes. These acts show a progressive realization of the difficulties of establishing farms on arid land and represent a series of attempts to overcome these difficulties as they have presented themselves, always in accord with the policy of facilitating the process of settlement.

Act of 1866.—The first difficulties presenting themselves related to the taking of water from streams to the land to be irrigated. This involved both the right to take the water and the right to construct ditches over public lands lying between the points of diverting water from streams and the land on which the water was to be used. There was uncertainty about both rights, and the act of July 26, 1866, removed this uncertainty, so far as the Federal Government was concerned, by recognizing rights acquired under "local customs, laws, and the decisions of courts," and by acknowledging and confirming the right-of-way for ditches over public lands.

This law has been passed upon by the United States Supreme Court many times, and is usually considered a sort of Magna Charta for the State control of nonnavigable streams of the arid region. Whether or not the rights of the States are based on this act of Congress, or merely acknowledged by it, it represents an important policy and one that has been much questioned since the Federal Government supplemented its policy of removing obstacles to reclamation by active participation in reclamation.

Those who have had Government reclamation work in charge, and those who have favored Federal control have held that State control of the water in many instances has hampered them in the carrying out of their policies. However, the United States reclamation act itself confirms and strengthens the policy laid down by the act of 1866, by providing that (sec. 8) nothing in the act shall be "construed as affecting or intended to affect" State laws providing for the control of water used in irrigation, and that in carrying out the provisions of the act the Secretary of the Interior shall proceed in conformity with such laws.

The desert land act.—The next act of Congress (after 1866) dealing with reclamation is the desert land act. This act, approved March 3, 1877, provided for the procuring of title to 640 acres of arid land by conducting water upon it and the payment of $1.25 per acre. The entryman was required also to expend at least $3 per acre in improvements and actually to reclaim at least one-eighth of the land. Desert lands are defined as "lands exclusive of timber lands which will not, without irrigation, produce some agricultural crop." The area that may be taken by one person under this act was limited by the act of 1890 to 320 acres. The reason assigned for

the passage of the desert land act was that, in order to be able to bear the cost of providing a water supply for desert land, the entryman must be able to get a larger tract than could be taken under the homestead act.

Under the desert land act a person may provide his own water supply or may obtain a water supply from a system supplying many farms. In the latter case the entryman purchases a water right from the parties who build the irrigation works, and submits evidence of such purchase as proof of reclamation. It is charged that much of the land that has passed into private ownership under this act has been obtained under "paper" rights that do not represent a water supply or actual reclamation. The regulations of the General Land Office now prevent such frauds. The area of land covered by original claims under this law, to June 30, 1922, is 32,378,882.65 acres, and the area covered by proofs of compliance with the law is 8,312,271.71 acres. The difference represents principally abandoned schemes, but partly lands in process of reclamation.

The weakness of the desert land act as an aid to reclamation work is the fact that the land can not be made security for the cost of reclamation. Title to the land remains in the Federal Government until it is actually reclaimed by the individual farmers, and no lien can attach to the land until title passes to the entryman. Prior to that time the constructing agency must have done its financing and expended the funds. If settlers fail to take up the land, or if they fail to carry out their plans and acquire title to land, there is no way in which the agency that has provided the water supply can enforce any contribution from the land. For the irrigation of individual farms, or for reclamation by agencies that can provide their own funds, the desert land act is still useful.

Irrigation survey.—In the act of October 2, 1888, making appropriations for various Government activities, provision was made for surveys by the Geological Survey to determine the extent to which the lands of the arid region of the United States could be reclaimed for irrigation. This act contained provision for reserving certain public lands from entry under the land laws, in the following language:

> And all lands which may hereafter be designated or selected by such United States surveys for sites for reservoirs, ditches, or canals for irrigation purposes, and all the lands made susceptible of irrigation by such reservoirs, ditches, or canals are from this time henceforth reserved from sale as the property of the United States, and shall not be subject, after the passage of this act, to entry, settlement, or occupation until further provided by law.[3]

A question arose as to the interpretation of the language quoted relative to the reservation of lands. The Department of the Interior and the Acting Attorney General interpreted the language to mean that "entries should not be permitted therefor upon any part of the arid regions which might possibly come within the operation of the act." This amounted to withdrawing from entry under any of the land laws all the public land in the arid region. This aroused such a storm of protest from the section involved that the provision was repealed by the act of August 30, 1890.

There was extended debate in Congress on the intent of the original provision and the interpretation put upon it by the executive departments. The interpretation of the Department of the Interior is set

[3] Sen. Ex. Doc., 1st Session, 51st Congress, No. 136, p. 3.

forth in a circular sent by the Commissioner of the General Land Office to registers and receivers of the United States district land offices, under date of August 5, 1889. It reads in part as follows:

> The object sought to be accomplished by the foregoing provision is unmistakable. The water sources and the arid lands that may be irrigated *by the system of national irrigation* are now reserved to be hereafter, when redeemed to agriculture, transferred to the people of the territories in which they are situated for homesteads.[4]

That the act contemplated a "system of national irrigation" as stated in this circular, was both asserted and denied many times in the debates in Congress; and that it contemplated the withdrawal of all public lands in the arid region from entry was most emphatically denied by those active in obtaining its passage.

The whole discussion seems to leave no doubt that Congress in providing for these surveys did not intend to establish a system of national irrigation, and that the advocates of such a system, in the Department of the Interior, defeated their purpose by enlarging the scope of the reservation provided for far beyond the intent of Congress. This destroyed what might have grown into a nationally controlled development of the arid lands of the West, and restored or reinstated the policy of leaving unobstructed the course of private development.

The Carey Act.—The Carey Act (act of August 18, 1894) was the next step in Federal aid to reclamation. It was enacted for the express purpose of curing the weakness of the desert land act and provided for making the cost of reclamation a lien on the land.

The act granted to each of the States containing arid land a limited area (1,000,000 acres), on condition that the States provide for its reclamation. The details were left to State legislation. None of the States has provided for making the cost of reclamation a direct lien on the land, and consequently the law has not met the situation entirely. However, the State laws have corrected some of the faults of the desert land act.

The plan of operation under the Carey Act is for the States to contract with construction companies for building the works to reclaim specific areas of public land to be claimed by the States. These contracts provide that the construction companies may sell "water rights" to reimburse themselves for the cost of construction, while the States sell the land, but only to parties who have contracted for the purchase of water rights. Thus the land and the water are tied together.

The weakness is in the financial features of the plan. For securing funds for construction the construction companies have depended on advance water-right sales and bond issues based on settlers' notes for deferred payments on water rights. Settlers have no title to the land until they can show actual reclamation, and until they get title, their notes are not liens on the land. Consequently, the bonds issued are not secured by the land.

In selling both water rights and bonds, the fact that the Carey Act projects are undertaken under Federal and State laws was made the basis of representation that the projects were in some way guaranteed by the Federal and State governments. It was also represented that

[4] Sen. Ex. Doc., 1st Sess., 51st Cong., No. 136, pp. 2 and 6.

the bonds were liens on the land. Neither of these things is true, and lax administration resulted in the undertaking of many unsound projects, to the great loss of both settlers and bond buyers. With closer public supervision and adequate financing of construction companies, there is no reason why the Carey Act should not prove useful in reclaiming public land. Because this act relates to public lands only, the field for its operation is constantly narrowing as the public lands are disposed of under this and other acts.

The total area segregated for reclamation under this act from its passage to June 30, 1922, is 3,813,991.18 acres; the total area patented is 1,018,131.24; and the area still segregated but not yet patented is 473,538.39. The balance of the segregations have been canceled.

Originally the area to be taken under the Carey Act was limited to 1,000,000 acres to each State containing arid land, but additional areas were granted to Idaho and Wyoming, the only States that have applied for sufficient land to exhaust the original grant, indicating that the limit on the area will be removed if occasion arises.

Reclamation act.—The United States reclamation act (act of June 17, 1902) provides for Government construction of irrigation works, with provision for repayment of the cost of construction by those who use the water. The repayment is spread over a period of 20 years, without interest on deferred payments. The public land within reclamation projects is taken by settlers under the homestead law, so that the settler actually receives as a subsidy his land and the interest on his deferred payments. In so far as payments are not collected, the subsidy is increased by the amounts not paid and by interest thereon.

While this act continues the policy of making homes on the land, it represents a fundamental change in policy in that it provides for a considerable public contribution, in addition to the land, toward defraying the cost of reclamation. It does not supersede any of the other laws, but merely provides another means of reclamation. However, the tendency is to discourage development under other acts, by offering more favorable terms.

The reason for the passage of the reclamation act was the difficulty of financing reclamation work in any other way. From the standpoint of the investor in reclamation enterprises, reclamation by irrigation in the United States had always been a failure. This was true of corporate enterprises, State district enterprises, and Carey Act enterprises. As a consequence, it had become almost impossible to obtain funds for reclamation work. The reclamation act provided the funds by creating a revolving reclamation fund from the receipts from the sale of public lands and added a subsidy by providing that the water users should repay only the cost of the irrigation works, without interest on deferred payments.

The act provides that the users of water furnished by works built under the act shall repay the cost of building the works, but in computing this cost interest on the money invested is not included. Since the Government is paying large sums for interest on borrowed money, the cost of this work to the Government includes interest as well as the money actually spent on the work. The amount of this additional cost, represented by interest, is shown for the work as a whole in Table 1, and for the principal projects in the table that

follows. The annual reports of the Reclamation Service show the "net investment." This is the difference between gross expenditures and gross receipts. The "corrected net investment" given in the tables is obtained by figuring interest at 4 per cent on the reported net investment for each year, plus previously accumulated interest.

TABLE 1.—*Cost of United States reclamation work to June 30, 1922.*

Reported debits	$171,496,409
Reported credits	41,350,449
Reported net investment	130,145,960
Corrected net investment (4 per cent interest on annual net investments, compounded, to June 30, 1922)	70,706,685
Total cost	200,852,645

As shown by this table, the cost to the United States, to June 30, 1922, has been about $200,000,000 instead of the $130,000,000 as reported. In fact, this is below the correct figure, since, in the computation made, interest on the expenditures in any year begins to run only after the close of the year, while the expenditures have all been made prior to that time.

The reported net investments on the principal projects, the corrected net investments, including 4 per cent interest, and the differences between these two, are shown in Table 2. The differences between the totals in this table and those shown in Table 1 are due to the omission of small and secondary projects.

TABLE 2.—*Financial statement of principal United States Reclamation Service projects, including interest at 4 per cent on net investments, compounded annually.*

Project	Reported net investment	Corrected net investment	Increase	
			Amount	Percentage
Salt River	$9,937,319	$17,246,238	$7,308,919	73.6
Yuma	9,114,565	13,864,034	4,749,469	52.1
Orland	904,324	1,342,223	437,899	48.4
Grand Valley	3,864,161	4,966,240	1,102,079	28.5
Uncompahgre	6,683,199	10,725,143	4,041,944	60.5
Boise	11,674,655	17,495,298	5,820,643	49.9
King Hill	1,547,279	1,670,187	122,908	79.4
Minidoka	4,650,145	7,759,073	3,108,928	66.9
Garden City	332,857	606,845	273,988	82.3
Huntley	1,673,369	2,542,678	869,309	51.9
Milk River	3,912,619	5,238,556	1,325,937	33.9
St. Mary's storage	2,769,382	3,656,196	886,814	32.0
Sun River	3,997,151	5,362,781	1,365,630	34.2
Lower Yellowstone	3,646,554	5,927,462	2,280,908	62.5
North Platte	12,013,348	16,982,136	4,968,788	41.4
Newlands	6,679,229	11,050,874	4,371,645	65.5
Carlsbad	1,171,032	1,843,540	672,508	57.4
Hondo	371,903	690,388	318,485	85.6
Rio Grande	11,928,644	14,031,982	2,103,338	17.6
North Dakota pumping	1,071,718	1,677,532	605,814	56.5
Umatilla	2,557,363	3,782,654	1,225,291	47.9
Klamath	3,290,579	4,968,440	1,677,861	51.0
Belle Fourche	3,527,805	5,698,229	2,170,424	61.5
Strawberry	3,196,219	4,767,909	1,571,690	49.2
Okanogan	1,420,077	1,936,191	516,114	36.3
Yakima	8,897,517	13,135,162	4,237,645	47.6
Shoshone	7,431,154	10,544,049	3,112,895	41.9
Total	128,264,167	189,512,040	61,247,873	47.8

The annual interest on the reported net investment plus previously accumulated interest for 1922, was about $7,725,000, or nearly twice the anticipated annual repayments on contruction charges.[5] With interest charges far exceeding repayments, the excess of actual cost as expressed in corrected net investment over reported net investment will increase very rapidly. In 1922 accumulated excess caused by compounding interest on net investment was slightly more than 50 per cent of the reported net investment.

The net investment just considered is not the "cost" that is to be repaid under the terms of the law, as repayments already made have been taken into account. In Table 3 the "net cost" of the various projects, in which repayments of construction charges have not been deducted, is given, with the same interest charges that are given in Table 2. The sum of these two items for each project shows what water users would have to repay if they actually reimbursed the Government for its outlay. The last column in Table 3 shows by what percentage the reported cost would be increased by adding interest on net investment at 4 per cent.

TABLE 3.—*Increase in net cost of United States reclamation projects caused by charging interest on net investment.*

Project.	Net cost.	4 per cent interest on net investment.	Total.[1]	Per cent increase on cost.
Salt River	$10,548,119	$7,308,919	$17,857,038	69.3
Yuma	8,942,183	4,749,469	13,691,652	53.1
Orland	1,057,959	437,899	1,495,858	41.4
Grand Valley	3,765,199	1,102,079	4,867,268	29.3
Uncompahgre	6,667,183	4,041,944	10,709,127	60.6
Boise	12,425,781	5,820,643	18,246,424	46.8
King Hill	1,471,624	122,908	1,594,532	8.4
Minidoka	6,846,240	3,108,928	9,955,168	45.4
Garden City	385,651	273,988	659,639	71.0
Huntley	1,467,685	869,309	2,336,994	59.2
Milk River St. Mary's storage	6,559,896	2,212,751	8,772,647	33.7
Sun River	4,037,840	1,365,630	5,403,470	33.8
Lower Yellowstone	3,566,406	2,280,908	5,847,314	64.0
North Platte	12,962,330	4,968,788	17,931,118	38.3
Newlands	6,691,415	4,371,645	11,063,060	65.3
Carlsbad	1,397,304	672,508	2,069,812	48.1
Hondo	371,867	318,485	690,352	85.6
Rio Grande	11,315,349	2,103,338	13,418,687	18.6
North Dakota pumping	684,797	605,814	1,290,611	88.5
Umatilla	2,798,885	1,225,291	4,024,176	43.8
Klamath	3,540,334	1,677,861	5,218,195	47.4
Belle Fourche	3,568,690	2,170,424	5,739,114	60.8
Strawberry	3,472,462	1,571,690	5,044,152	45.3
Okanogan	1,398,058	516,114	1,914,172	36.9
Yakima	11,005,461	4,237,645	15,243,106	38.5
Shoshone	7,479,857	3,112,895	10,592,752	41.6
Total	134,428,575	61,247,873	195,676,448	45.6

[1] Net cost plus interest.

It will be noted that there are wide differences between the percentages given in the last column, representing the various projects. These differences are due largely to differences in the time when expenditures were made, that is, how long interest has been running, and differences in the time when repayment of construction charges

[5] In a statement before a Congressional committee on December 11, 1922, the Director of the Reclamation Service estimated the receipts for the fiscal year 1924 from construction repayments at $4,000,000.

began. With the exception of the Garden City and Hondo projects, which have been abandoned and, perhaps, should be written off, and the North Dakota pumping project, which has been in and out so far as operation is concerned, the project ranking highest in amount of interest and in percentage of increase is the Salt River project. This is due to the fact that the heavy expenditures on this project were made many years ago and repayment began only recently. The act originally provided for the repayment of the cost of a project in a period of 10 years. Under the extension act this period was extended to 20 years and the Secretary of the Interior was given authority to fix for each project the time when the period of repayment should begin. This extension of the time to 20 years, and each year's delay in fixing the date of repayment is, in effect, a large increase in the cost when interest is included, as it must be in determining actual cost.

The preceding statements are based on the cost of reclamation works to the Government. The amount of the subsidy to farmers represented by relief from interest is more correctly represented by what farmers would have had to pay as interest on deferred payments had water been supplied by private enterprises.

The reclamation act provides two schedules of payments, extending over 20 years. Section 1 of the act of August 13, 1914, known as the extension act, provides for lands that thereafter become subject to the law the following schedule: At the time of making water-right application or entry "5 per centum of the construction charge fixed for his land as an initial installment, and shall pay the balance of said charge in 15 annual installments, the first five of which shall each be at 5 per centum of the construction charge, and the remainder shall each be 7 per centum until the whole amount shall have been paid. The first of the annual installments shall become due and payable on December 1 of the fifth calendar year after the initial installment."

Section 2 provides for lands already subject to the law the following schedule:

> Twenty annual installments, the first of which shall become due and payable on December 1 of the year in which the public notice affecting his land is issued under this act, and subsequent installments on December 1 of each year thereafter. The first four of such installments shall each be 2 per centum, the next two installments shall each be 4 per centum, and the next fourteen each 6 per centum of the total construction charge, or the portion of the construction charge unpaid at the beginning of such installments.

A computation of the amounts that would be due if interest at 6 per cent were charged on deferred payments, shows that a farmer operating under section 1 of the act would pay 72 per cent more than one who pays the announced charge in accordance with the law; and that one operating under section 2 would pay 66 per cent more than one paying the announced charge. These figures do not, however, measure the subsidy, since this should include interest on the amount by which the payments required by law fall below the payments required if interest were charged. Including such interest in the computed subsidy, at the end of the 20-year period, when charges under the existing law have been met, the person operating under section 1 would still owe 146 per cent of the original charge, and one operating under section 2 would still owe 136 per cent of

the original charge. At no time would the payment made equal the interest due.

These statements are based on the assumption that payments are made as they become due under existing law, and that payments begin when water is made available. In most cases water was supplied to many farmers for several years before payments began. The only farmers to whom the amount of the subsidy will be as small as that shown in the table, 146 or 136 per cent of the construction charge, will be those who come to a project after the charge has been announced, make application for water, and begin and continue payments according to the schedule laid down by the law.

Table 4 shows, by projects, the years that elapsed between the time when water was first supplied to farmers and the time when payments on water rights began.

TABLE 4.—*Number of years during which water was supplied to farmers under United States reclamation projects before payments of construction charges began.*

Project.	Year in which water was first supplied by U. S. Reclamation Service.[1]	Year in which first payment on construction charges is reported.[2]	Number of years during which water was supplied before payments began.
Salt River	1907	1918	11
Yuma	1907	1910	3
Orland	1910	1917	7
Uncompahgre	1908	1922	14
Grand Valley	1915	1922	[3] 7
Boise	1906	1918	12
Minidoka	1907	1908	1
Huntley	1908	1908	0
Sun River	1909	1908	0
Milk River	1911	----------	[3] 11
Lower Yellowstone	1909	1909	0
North Platte	1908	1909	1
Newlands	1906	1908	2
Carlsbad	1907	1909	2
Rio Grande	1908	1922	14
Williston	1908	1909	1
Umatilla	1908	1909	1
Klamath	1907	1909	2
Belle Fourche	1908	1909	1
Strawberry	1915	1916	1
Okanogan	1908	1909	1
Yakima	1907	1908	1
Shoshone	1908	1908	0

[1] Taken from Twentieth Annual Report of U. S. Reclamation Service.
[2] Taken from Annual reports of U. S. Reclamation Service showing payments.
[3] Had not begun June 30, 1922.

Table 4 shows that on four of the projects payments began as soon as water was delivered by the Reclamation Service; on eight of them payments began the next year after the first water was supplied. At the other extreme there are two projects on which payments had not begun in 1922, two on which payments did not begin until 14 years after the service began supplying water, on one other project they did not begin until 12 years, and on two others until 11 years, after water was first supplied. Table 5 shows the effect of postponement in beginning the collection of charges on the amount of the subsidy represented by relief from interest charges

under section 2 of the act, the section under which most of the projects are operating. The percentages under section 1 would be slightly larger.

TABLE 5.—*Percentages of announced charges remaining unpaid at beginning and end of 20-year period of payment, when 6 per cent interest compounded annually on deferred payments is included.*

[Under section 2 of extension act.]

Period of postponement.	Percentage of charge unpaid when payments begin.	Percentage of charge unpaid when payments end.	Period of postponement.	Percentage of charge unpaid when payments begin.	Percentage of charge unpaid when payments end.
None	100.00	135.59	8 years	157.39	315.28
1 year	104.00	153.73	9 years	166.95	344.22
2 years	110.36	173.00	10 years	177.09	374.92
3 years	117.10	193.45	11 years	187.84	407.44
4 years	124.25	215.08	12 years	199.23	441.87
5 years	131.83	237.94	13 years	211.30	478.44
6 years	139.86	262.29	14 years	224.10	517.10
7 years	148.37	288.02			

Since the payments never equal the interest, the amounts unpaid increase even after the payments begin. Table 4 shows for each project the number of years during which water was supplied before payments of construction charges began. Not all of the land was ready for water when water was first supplied, and the projects were not in position to supply water to all the land within their limits at the time when water was first supplied; consequently the subsidies to individual farmers will vary with the length of time water had been used before payments began. The percentages given in the table represent the maxima for the several projects, with the percentages for individual farmers varying from these maxima to the percentages shown in the first line of the table, the latter applying to those who begin paying as soon as they begin using water.

For example, take the Salt River project. The announced charge for water is $90 per acre. Water was supplied to some farmers 11 years before payments began. At the beginning of payments the accumulation of interest charges would have increased the charge to 187.84 per cent of the announced charge, or to $169.06; and at the end of the 20-year period during which the $90 will be repaid, without interest, the accumulated debt, with interest, will amount to 407.44 per cent of the $90 charge, or $366.70. This represents the subsidy, per acre, to such a farmer in the Salt River Valley at the time when the Government will consider his debt discharged. For the farmer who came in and began to use water at the time when payments began, the corresponding figures will be $90 and $122.03. For others who began using water between these dates the subsidy will vary between these limits.

As already shown, if the payments begin when the use of water begins and are made as they become due the subsidy amounts to slightly more than one and one-third times the announced cost. The various projects lie all along the line between that and the instance just cited.

Table 6, taken from the twenty-first annual report of the United States Reclamation Service, shows the material results accomplished, to 1922:

TABLE 6.—*Results of the work of the United States Reclamation Service.*

	Acres.
Acreage to which service was ready to supply water in 1922	1,700,000
Acreage irrigated, in 1922	1,250,000
Acreage in crops, in 1922	1,175,000

Irrigation district act.—Under the act of August 11, 1916, public lands within the boundaries of irrigation districts organized under State laws may be included within such districts under certain conditions, including the approval of district plans by the Secretary of the Interior. Under the State irrigation district laws the cost of irrigation for each district is taxed against the land included within that district. The effect of the Federal act is to make the public lands within approved districts subject to these taxes, with a provision that "nothing in this act shall be construed as creating any obligation against the United States to pay any of said charges, assessments, or debts incurred," but that the charges shall be met by the person who takes up the land. Until someone applies for the land there is no way of making the land liable for its share of the cost of providing the water supply.

This act, like the Carey Act, is an attempt to make the land finance its own reclamation, without making the land directly liable for the cost. As under the Carey Act, there is State and Federal approval of projects, and an appearance of public liability for cost that does not exist in fact.

The fundamental policy running throughout the whole series of Federal laws has been to let the public lands supply the financial basis of their own reclamation. Under the swamp land acts (1849, 1850, 1860) the swamp lands in the States then organized and containing public lands were granted to the States in order that the States might reclaim them. The desert land act (1877) enlarged the area that might be taken by one person over that allowed under the homestead act, for the alleged reason that the cost of supplying the water for irrigation made this necessary. The Carey Act (1894) attempted to solve the problem of making specific areas of public land security for the funds to build the irrigation works for their own reclamation. The irrigation district act (1916) is another attempt at the same thing. The reclamation act (1902) made funds arising from the sale of all public lands available for the reclamation of limited areas. Later acts (oil leasing act, 1920; water power act, 1920) have added to the reclamation fund a part of the receipts from leases of privileges on other public lands.

It is to be observed that throughout the whole period the problem has been the financing of reclamation, and the measures have run all the way from granting rights-of-way for ditches to giving away the land and advancing the money without interest to pay for the construction of reclamation works.

The report of the Fourteenth Census shows that 80 per cent of the land irrigated in 1919 was supplied with water by enterprises that have received no public aid or endorsement; 6.5 per cent by enterprises developed through the use of public funds; and 2.7 per cent through the granting of lands under the Carey Act. Of the balance, 9.5 per cent was in 1919 supplied with water by irrigation districts organized under State laws.

STATE LAND RECLAMATION POLICIES.

State reclamation policies have included the reclamation of swamp and overflowed lands as well as the reclamation of arid lands. Because the swamps are situated for the most part in the eastern part of the country, which was occupied first, reclamation by drainage antedated reclamation by irrigation. However, to preserve continuity in subject matter, State irrigation policies will be discussed first, and drainage will be taken up later.

GENERAL CONSIDERATIONS

The earliest State legislation on this subject, as was the case with Federal legislation relating to irrigation, was designed to remove obstacles to development rather than to provide direct public aid. These laws relate to rights to take water from streams, to rights-of-way for ditches, to the incorporation of irrigation companies, to the operation and control of ditches, etc. The report of the census of 1920 shows that 80 per cent of the land irrigated in 1919 was supplied with water by enterprises operating under these general laws.

IRRIGATION DISTRICTS.

State aid to irrigation development, with a few unimportant exceptions, has been extended through irrigation district laws which provide a means for making the lands liable for the cost of their own reclamation.

The earliest of these laws, that of Utah, enacted in 1865, merely gave to districts the right to tax the lands within their boundaries for the purpose of raising funds to pay for providing a water supply for their irrigation. This was not effective, because, until the works were built, the lands could not produce anything with which to pay taxes.

The next step in advance was to give such districts the power to issue bonds to be paid from taxes levied on the lands within their boundaries. This made it possible to obtain funds before the land could produce. The first law of this kind was enacted in 1887 in California. Since that date all of the States in which irrigation is generally practiced have adopted similar laws.

These laws provide that a district may be organized only upon petition from at least a majority of the owners of land in the proposed district, who must also represent a majority of the acreage included; and upon a favorable vote of these land owners, the favorable vote required varying from a majority to two-thirds. If these conditions are fulfilled, land can be included in a district against the will of its owner, and obligated for its share of the cost of providing a water supply.

It was believed by the promoters of private enterprises that their inability to force the owner of land for which a water supply had been provided to contribute to the cost by the purchase of "water rights" was the principal reason for their financial failure, and that the organization of districts would remedy this. In accordance with this idea, the original safeguards contained in the district laws consisted of provisions for such public supervision of the organization of districts as would make assessments binding upon land included against the will of its owners, and for testing in the courts the validity of the proceedings for organization and for the issuing of bonds.

These provisions disregarded, so far as public inquiry or investigation are concerned, all engineering, agricultural and economic questions. Under them a great many districts that were not economically and financially feasible were organized and issued bonds. Most of these early districts failed to meet fully their financial obligations and bond purchasers were compelled to take total or partial losses. This largely destroyed the market for district bonds, or caused their sale for less than par. The laws fix a minimum price at which bonds may be sold, but these laws are evaded by paying for construction work with bonds, the price of the work being fixed in accordance with the discount on the bonds.

Public investigation and report on the feasibility of plans for proposed districts was the first remedy adopted. The State officials charged with the duty of reporting upon districts generally were not given authority to veto their organization, but merely to report upon their feasibility. However, an adverse report usually amounted to a veto, as it would go far to prevent the sale of bonds, which was already difficult.

The next step was making district bonds legal investments under certain conditions for trust funds and public funds, and for insurance companies, banks, etc. California was the first State to enact such a law (1913). This law creates a bond commission, which investigates: (1) The water supply; (2) the soil and its probable water requirements; (3) the feasibility of the plan for supplying water; (4) the reasonable market value of the water, water rights, and irrigation works of the district; (5) the reasonable market value of the land in the district; (6) whether the proposed bond issue, together with others that have been issued or proposed, exceeds 60 per cent of the value of the water, water rights, works, and land; and (7) the character and number of bonds proposed to be issued. If the commission reports favorably on all these points the bonds are certified by the State comptroller and become legal investments for the types of investment mentioned.

Similar laws have been enacted in Arizona, Colorado, Idaho, Montana, Nevada, Oregon, and Utah. The Utah law was repealed in 1923.

It is to be noted that State certification carries no State guarantee, and that the certification laws make the investment of trust and public funds permissible, but not mandatory. Trustees and public officials must still exercise ordinary discretion as to such investment of the funds in their charge. The object of the law is not, primarily, to induce the investment of the funds mentioned in district bonds, but, rather, to improve the standing of such bonds in the general market.

At present, under the California district law, the State engineer examines and reports upon each district before it is organized; he is a member of the bond commission and, in that capacity, reports on the water supply, the water requirements of the soil, and the feasibility of the plan for supplying water. The commission employs an appraiser to pass upon the value of the land. The commission has no control or supervision of the expenditure of the funds arising from bond sales, either in law or in practice.

Apparently the California law has been effective, as many districts have been organized and their bonds certified and sold since the passage of this law. With the exception of the lack of supervision of expenditures, this law seems to provide all possible safeguards against the issuing of inadequately secured bonds. There is, of course, opportunity for mistakes of judgment in passing upon the questions of water supply, cost of irrigation works, and in the appraisal of land, particularly in determining the prospective ability of the farmers to meet annually recurring charges for water rights; and there is always strong pressure toward excessive optimism in these matters.

Up to February, 1923, there had been only a few defaults in interest payments on bonds certified by the California commission. All funds for district purposes are raised by taxing the lands within the district, and delinquencies are met by the sale of the land at tax sale. At present the period of redemption is three years, which makes collection by bondholders a slow and tedious process. It is reported that this fact is hindering the sale of district bonds, and attempts are being made to have the period of redemption reduced to one year.

It is doubtful whether such a change would help much. Bondholders want prompt and regular payments; they do not want the trouble of collecting through tax sales or the foreclosure of mortgages. If there are extensive defaults, even though the security is ample and the collections are made eventually, the efficacy of State certification as a means of promoting bond sales will be greatly reduced.

In California there are large areas within irrigation districts that are not producing enough to pay district taxes. These areas are in large holdings that are used for grain growing or for pasture. These lands must be put into more valuable crops if they are to meet their share of district taxes, and this involves the bringing in of more settlers.

Oregon has gone one step further than has California. In Oregon the State certifies the bonds as legal investments for trust funds, etc., and it also advances the interest on district bonds for periods varying from one year to five years. Under the Oregon district law, district bonds run for 20 years, and payments on principal do not begin until the eleventh year after the bonds are issued. Thus, during 10 years the landowners pay only operation and maintenance charges and interest, while State payment of interest leaves only operation and maintenance charges to be met by the landowners during the period of State payment, except that the State requires the districts to pay interest on the interest advanced by it.

Under the latter provision a district that had issued 6 per cent bonds would pay to the State only 0.36 of 1 per cent on its bonds

during the period of payment of interest by the State instead of the 6 per cent called for by the bonds. The advances made by the State to a district are to be repaid after the bonds of the district have been paid, that is, after 20 years.

The Oregon law does not give the State authority to supervise the expenditure of funds raised by the sale of certified bonds, but the State administrative officers have made such supervision a condition of their approval of the bonds. None of the State-aided districts has yet (1923) reached the stage where it must pay its own interest, and the test of the efficacy of the law has not yet come.

Oregon districts, like those in California, contain large areas that are not now producing sufficiently to meet district taxes. In order to meet these taxes these lands must be brought into production, and that involves sale and settlement. As an additional safeguard for the State's investment the State officials charged with passing upon bond issues have made the listing of nonproducing land for sale at reasonable prices a condition of the approval of bond issues. The idea behind this policy is that the interests of the State demand the settlement of such land by persons who have at least a fair chance to succeed and become permanent farm owners; and that the sale of land at high prices foredooms the settlers to failure, and hinders rather than promotes the progress of the districts.

Washington State does not certify bonds as legal investments for trust and public funds, but has created a special "reclamation" fund of $5,000,000 which is to be used in the purchase of district bonds. In theory this is a revolving fund, to be used in the purchase of bonds, that are to be resold by the State, but with no certification or guarantee by the State. This fund has been used to assist districts that have begun works and need additional funds to complete their works and get them into use. While the law does not provide directly for this, the reclamation officials have required State supervision of expenditures as a condition of their purchase of district bonds. The State has purchased several bond issues at 90, and has resold some of these bonds. In one instance it sold bonds at 95. The operations under this law have not been extensive enough to show its possibilities.

The Idaho bond certification law was enacted in 1921. It is similar to the California law, but provides a larger margin of safety, in that the board certifies that the total bonded indebtedness of a district does not exceed 50 per cent of the reasonable value of the lands with the water. Proposed districts are investigated by State officials before they are formally organized; they are investigated again before bonds are voted; and yet again before bonds are certified. As a rule, the engineers' reports are depended upon for the value of the land. In a few instances appraisers have been employed.

In Idaho there has been little activity in the organization of districts for new construction since the passage of the certification law. Most of the bonds certified have been issued for the purpose of refunding former issues, or for taking over works built by other agencies. Some of the refunding has been at very low figures—25 to 50 cents on the dollar—and the participation of the State in such refunding

has caused a great deal of criticism that has tended to put a stop to such action.

Certified bonds are reported to have sold for from 80 to 85 cents on the dollar, although a few old, well-established districts have been able to get as high as 95 cents, and one such issue has been sold at par. Since the passage of the law no uncertified bonds of Idaho districts have been sold. These facts indicate that certification is essential to sale, but that it has not enabled districts to get full price for their bonds.

Utah enacted a bond certification law in 1919 and repealed it in 1923. Under the Utah law the bond commission had supervision over the expenditure of funds raised by the sale of certified bonds. Under this act, two bond issues were certified and both of these were in default.

Two reasons for the repeal of the law were given: A member of the certification commission stated that the repeal was recommended by the commission itself because it felt that its work was a useless duplication of other work and because the State auditor, who is charged with the actual certification of the bonds, but on the recommendation of the commission, was not willing to certify bonds without investigation by his own office. This member of the commission stated that bond dealers did not accept the work of the commission, but had their own engineers and lawyers make just as complete investigation as if the commission did not exist. Under such circumstances, the commission felt that its work was a waste of time and money. Another official stated that parties whose project had been turned down by the commission were responsible for the repeal of the law.

Wyoming enacted a certification law in 1921 but this was declared unconstitutional. A bill for another certification act was introduced in 1923 but was not passed. Wyoming, in 1923, enacted a law authorizing the investment of its permanent school fund in bonds of irrigation and drainage districts. The law provides an exofficio board to pass upon bonds to be purchased, consisting of the governor, the secretary of State, the treasurer, the auditor, and the superintendent of public instruction. Before bonds may be purchased they must be approved unanimously by this board, and also by the State engineer and the attorney general.

Colorado enacted a bond certificate law in 1921, but uncertainty as to its meaning has prevented the certification of bonds.

The province of Alberta, Canada, has gone further than any of our States, and has provided for guaranteeing both principal and interest of district bonds. Some bond issues have been approved and guaranteed, but the law is of such recent date that no opinion as to its value can be formed.

The report of the Fourteenth Census shows that in 1919 irrigation districts organized under State laws supplied water to 9.5 per cent of the total area irrigated in that year. A large part of this land represents reorganizations of enterprises developed under other types of organization, but the census reports do not show just how much land comes under this classification.

A review of the experience of our western States in aiding irrigation development by providing for the organization of districts and in attempting to give district bonds a standing in the market leads to the following conclusions:

Each advanced step in public supervision has, for a time, been effective in promoting the sale of bonds.

The latest laws, providing for State certification of bonds as legal investments for trust funds, etc., seem to go as far as it is possible to go in public supervision that involves no public liability. These laws contain ample authority for investigation and the practice in the various States seems to be to include all reasonable safeguards. The fact remains, however, that some certified bonds are in default and there is a widespread belief that others soon will be.

Even if it proves that the security behind the bonds is sufficient to prevent loss on the part of bondholders, it will take but a few defaults to render the scheme ineffective, since bond buyers do not care for investments that necessitate foreclosure.

In certifying bonds, the States assume no legal liability, although there may be some moral obligation if public and trust funds, or even private funds, are lost through default on bonds on which the State has put its stamp of approval. On the other hand, when the States have put their funds into paying interest, or buying bonds, or constructing works, there is a distinct possibility of financial loss. That this is a real possibility is shown by Table 7, made up from a report on irrigation districts, prepared by the Bureau of Public Roads of the Depatment of Agriculture.[6]

TABLE 7.—*Number, purpose, and present status of irrigation districts organized under State laws.*

All districts reported:	
Number	598
Number operating	244
Percentage of total	40.8
Number gone out of business	158
Percentage of total	26.4
Number in preliminary stages	196
Percentage of total	32.8
Districts organized for the purpose of developing new projects:	
Number	248
Percentage of all districts	41.5
Number operating	46
Percentage of total of this class	18.5
Number gone out of business	110
Percentage of total of this class	44.4
Number in preliminary stages	92
Percentage of total of this class	37.1
Districts organized for the purpose of taking over projects developed by other agencies:	
Number	350
Percentage of all enterprises	58.5
Number operating	198
Percentage of total of this class	56.6
Number gone out of business	48
Percentage of total of this class	13.7
Number in preliminary stages	104
Percentage of total of this class	29.7

[6] Hutchins, Wells A., Irrigation District Operation and Finance, United States Department of Agriculture Bulletin No. 1177.

TABLE 7.—*Number, purpose, and present status of irrigation districts organized under State laws*—Continued.

Excluding districts that were in the preliminary stages of organization and construction, because they have no record of success or failure by which they can be judged, gives the following results:	
All districts that have passed beyond preliminary stages:	
Number	402
Number operating	244
Percentage of total	60.7
Number gone out of business	158
Percentage of total	39.3
Districts organized for the purpose of developing new projects which have passed beyond preliminary stages:	
Number	156
Percentage of all districts	38.8
Number operating	46
Percentage of total of this class	29.5
Number gone out of business	110
Percentage of total of this class	70.5
Districts organized for the purpose of taking over projects developed by other agencies which have gone beyond preliminary stages:	
Number	246
Percentage of all districts	61.2
Number operating	198
Percentage of total of this class	80.5
Number gone out of business	48
Percentage of total of this class	19.5

The statement shows that 26 per cent of all districts organized have failed. Of the districts that have passed beyond the preliminary stages 39 per cent have failed.

About three-fifths of all the districts organized have had for their purpose the taking over of enterprises developed by other agencies. In those cases, 57 per cent have succeeded—at least they are still operating—and only 14 per cent have failed. Of districts that were organized to develop new projects only 19 per cent are operating and 44 per cent have failed. These statements refer to all districts reported, including those still in preliminary stages.

A better measure of the record of failure is furnished by the districts that have passed beyond the preliminary stages. Considering these districts only, 61 per cent are still operating, and 39 per cent have failed. Of those organized to take over existing projects, 80 per cent are operating and 20 per cent have failed. Of those organized to develop new enterprises only 30 per cent are operating, and 70 per cent have failed.

On the basis of these figures the chances for failure on the part of districts organized to develop new projects are more than 2 to 1. Probably careful investigation prior to approval and State supervision of expenditures will decrease the chances of failure, but there will be still a considerable probability of failure, with consequent loss on the part of the State where the State has assumed any financial responsibility, and with demands for public reparation where the State has certified bonds without assuming any legal liability.

CALIFORNIA STATE LAND SETTLEMENT.

In 1917 California undertook another policy new to this country, that is, State land settlement.[7] The State buys land, provides irriga-

[7] Act of June 1, 1917.

tion and drainage works, as may be necessary, subdivides the land into farms, farm-laborer's allotments, and town lots, and sells the land on easy payments to actual settlers. The law authorizes the land settlement board, which administers the law, to prepare the land for cultivation, seed, plant, and fence the land and put up buildings or make any other improvements "to render the allotments habitable and productive in advance of or after settlement." The cost of improvements on any one allotment may not exceed $1,500. The law also authorizes loans for stock and equipment, the amount to be loaned to one individual not to exceed $3,000, including the amount spent on improvements.

The prices of the land are to be fixed at a figure that will cover the cost of the land, the cost of its reclamation, the cost of land set aside for highways and other public purposes, the cost of subdivision and sale, and such amount as may be deemed necessary to meet unforseen contingencies. In short, it is intended that the enterprises shall be entirely self-supporting and devoid of subsidy.

Funds have been provided by direct appropriation by the State legislature, with provision that they shall be returned to the treasury with interest at 4 per cent per annum within a period of 50 years. Overhead expenses during the period of construction and settlement are included in the prices charged for the land, and after that time they are to be covered by the difference between the 5 per cent interest paid to the board by settlers, and the 4 per cent interest paid by the board to the State.

Settlers are required to pay, at the time of purchase, 5 per cent of the price of the land and 40 per cent of the cost of the improvements that have been made or are made by the board for the settler. The balance of the price of land is to be paid in amortized payments running not more than 40 years, the balance on improvements in not more than 20 years, and livestock and equipment loans in not more than 5 years. The rate of interest on deferred payments is 5 per cent.

The purchaser is required to establish residence on the land within 6 months from the time of purchase, and to remain on the land at least 8 months of each year. He may not sell without the consent of the board, and must agree to cultivate the land in a manner approved by the board. The law gives the board authority to reject any applicants for allotments for any reasons that it may choose.

The California land settlement law was enacted in the belief that the cause of the financial failure of reclamation enterprises was delay in settlement and use of land, and that the causes of failure of settlers on reclaimed land were lack of capital and the use of short-term credit, which swamped them before they could get their land into use. The scheme was designed to correct all these conditions, and also to keep off the land those who, in the opinion of the board, were not likely to succeed because of lack of capital, lack of experience, or lack of adaptability to farming.

To 1923 two colonies had been established, one at Durham, in the Sacramento Valley, and one at Delhi, in the San Joaquin Valley.

The Durham colony was established in 1917. The board purchased about 6,000 acres, prepared it for settlement, and put a part of it on the market in 1918. The report of the board, dated September 1, 1922, shows that at that time all of the farms had been sold. There

were 139 families on the settlement, made up of 105 farmers and 34 farm laborers. The crop report for the year 1922 shows practically all of the land in either crops or pasture. Thus, within five years from the purchase of the land it was all in use. This is in marked contrast with the common experience with reclaimed land (see p. 32), and shows that in this instance and in this respect the law has come up to expectations. In this instance conditions were peculiarly favorable. The project was small, the reclamation work was done during a period of low prices, while the land came on the market at a time when high prices, patriotic appeals, nation-wide free advertising, and the prestige of State construction all combined to bring about quick sales. The test of the financial success of the plan has not come, for payments extend over a long period of years. The report referred to contains the following statement regarding payments by the settlers at Durham:

> The first two years they (payments) were made with remarkable promptness and for the full amount due, but as prices dropped the strain showed in the division's receipts. Instead of being made promptly and for the full amount, payments would be made as the settler could raise the money and in whatever amounts he could get together. If the Durham settlers had all had to depend on the local banks for money for development, half of them would have lost their farms during the last two years (p. 25).

While the report does not say so, specifically, it seems to indicate that at least half of the settlers were sufficiently in arrears in their payments to have made them liable to foreclosure under ordinary mortgages. The board was in position to carry them over this depression, when a bank might not have been in such a position. In this respect State reclamation has the same advantage that national reclamation has over private reclamation—the financing agency is not forced to the wall, since the public treasury carries the burden.

The Delhi tract was purchased in 1919, and in 1922, when the report referred to was prepared, the irrigation system had not been completed, but it was so far completed that the last of the land was offered to settlers in November, 1922. The first of the land was opened to settlement in May, 1920, a second unit in September, 1920, a third unit in January, 1921, and the fourth and last unit in November, 1922. In September, 1922, 5,640 acres had been offered for sale, and 4,174 acres, or 74 per cent, had been sold. That is, in three years from the time the State purchased the land, 74 per cent of that which was ready for settlers had been sold. Unpublished reports indicate that since the date of the published report sales of the balance of the land then on sale and of the fourth unit have not been so rapid.

This project encountered conditions exactly opposite to those at Durham. The reclamation work was done at peak prices, while the land came on the market during the depression in agriculture. Notwithstanding these conditions, the rate of settlement has been much more rapid than is customary (see p. 32). The rapidity of settlement of the remaining land will depend largely upon general agricultural conditions. The selling price of land is high, and the cost of putting in water-distributing systems and preparing land for irrigation is high; therefore, high prices for agricultural products must be in prospect to induce settlement.

As at Durham, many settlers are in arrears in their payments, and in addition to this burden the board must continue to carry the burden of interest and overhead expenses chargeable to the unsold land. In this respect the experience of the board is exactly parallel to that of private enterprises, except that the creditor of the board is the State, which created it, and, consequently, the board is not forced to make collections and can, in its turn, be lenient with settlers.

The work has been financed by direct appropriations made by the legislature. A proposal to issue bonds for obtaining additional funds, passed by the legislature in 1921, was referred to a popular vote in 1922 and defeated. The legislature in 1923 made no further appropriation for the work. The appropriation already made, however, constitutes a revolving fund, and payments made by settlers become available for new work. Without further legislation, future settlements must be limited to those that can be carried on with the receipts from settlers on the existing projects.

If it develops that the State settlement projects are a financial success, and that settlers can succeed on the prepared farms purchased on easy terms, when they can not under other conditions, these experiments may show the way for private enterprise, if the State does not provide for further work.

PROPOSED FEDERAL AND STATE COOPERATION.

On account of a desire to reclaim lands more rapidly than can be done under the Federal reclamation act, because of the smallness of the fund; or under private enterprise, because of the difficulty of financing the work, there have been proposals to combine Federal and State efforts. The plan proposed is for the Federal Government to build the reclamation works for organized irrigation districts, take the bonds of the districts in payment for their work, hold the bonds until the advance in land values is sufficient to make the bonds saleable, and then sell the bonds to reimburse itself for its expenditures. It is proposed that the Federal Government shall issue its own bonds to obtain the funds for this work, in the first instance.

It will be observed that this scheme involves the elimination of the subsidy feature of the reclamation act, since it is proposed to have the Federal Government issue interest-bearing bonds to obtain funds and to have the districts issue interest-bearing bonds to the Government. Consequently, the farmers whose lands will be liable for the district bonds will be called upon to pay interest on deferred payments, and the burden will begin to accumulate on the land as soon as bonds are issued, rather than when application for water is made. Under the existing law no interest on the funds invested by the Federal Government is included as a part of the cost of construction, payments do not begin until the Secretary of the Interior issues public notice, and there are no interest charges during the period elapsing between the beginning of construction and the time when payments begin, nor on deferred payments thereafter. The amount of the subsidy represented by this relief from interest charges has been discussed. (See pp. 7–12.)

It is evident, therefore, that the cost to farmers under the proposed scheme would be very much greater than the cost under the existing reclamation law.

It should be noted that it is proposed that the Federal Government shall finance construction in the first instance. There is nothing in the history of either the Reclamation Service or the irrigation districts to indicate that the reclaimed lands will be put into use promptly, or that settlers will be able to meet their payments promptly when they get on the land. It is not improbable, therefore, that should this scheme be adopted the Federal Government would be compelled to carry the investments indefinitely; or, if it should sell the district bonds to the public, probably it would be morally, if not legally, bound to guarantee payments of both interest and principal as they become due.

DRAINAGE RECLAMATION.

Attention has been called to the fact that the Federal Government, by the acts of 1849, 1850, and 1860, granted all the Federal swamp lands to the States in which they were situated. Except for these acts the Federal Government may be said to have no drainage reclamation policy. From time to time there have been proposals to extend the provisions of the reclamation act, which are now limited to providing a water supply for irrigation and incidental drainage, to the draining of wet lands, but no such action has been taken.

The reclamation act was originally a western measure. It provided that the proceeds from the sale of public lands, which were mostly arid or semiarid, and situated in the Western States, should be used to provide a water supply for the irrigation of arid and semiarid lands within those States. It nominally applied principally to public lands, although private lands were included in its operation. Under those circumstances there was no reason for including reclamation by drainage. But, in fact, a large part of the land in Federal reclamation projects is privately owned, and there is no inherent reason why the general plan of the reclamation act should not be applied to the draining of privately-owned wet lands. The Government might with equal propriety, if it is considered wise, provide drainage works and collect the cost from the owners of the land benefited, just as it provides irrigation works in the West, under the law providing for the payment of the cost of construction by the water users.

The proposals for combined Federal and district reclamation actively discussed on the preceding page have included drainage as well as irrigation.

State drainage policies.—From the beginning of efforts to reclaim swamp and wet lands in the several States, the policy of the States has been to make the lands pay for their own reclamation. The means used for the accomplishment of this purpose has been the adoption of legislation providing for the organization of districts, which are given the power to incur indebtedness and to assess the lands benefited to meet the cost of the construction and maintenance of drains.

Table 8, taken from the report of Fourteenth Census, gives the years in which the States adopted their first general drainage laws.

TABLE 8.—*Dates of first general laws authorizing the establishment of public drainage enterprises, by States.*

[Statutes authorizing merely the construction of levees, or drainage for sanitary purposes, are not included.]

State.	Year.	State.	Year.
Michigan	1847	Colorado [2]	1893
Ohio	1847	Florida	1893
Indiana	1852	Kentucky	1893
South Carolina	1856	Texas	1895
Minnesota	1858	Utah	1896
Missouri	1859	Mississippi [3]	1898
Wisconsin	1862	Idaho [4]	1903
Illinois	1865	Montana	1905
California	1868	Oklahoma	1905
North Carolina	1869	Virginia	1906
Kansas	1870	Tennessee	1909
Iowa	1872	Georgia	1911
Nebraska	1873	Nevada	1911
Washington [1]	1875	Wyoming	1911
Oregon	1880	Arizona	1912
North Dakota [1]	1883	New Mexico	1912
South Dakota [1]	1883	Alabama	1915
Louisiana	1888	West Virginia	1917
Arkansas	1891		

[1] These first statutes were enacted by the Territories before admission as States.
[2] A law was enacted in 1883 and repealed in 1885.
[3] A law applying only in Lee County was enacted in 1886.
[4] This statute was declared unconstitutional in 1912, and a new law was enacted in 1913.

Prior to the dates given in Table 8, many districts were provided for by special acts, and there are still many special-act districts, particularly in Arkansas, California, and Florida,[8] created either because the general law did not seem to apply or because the promoters of the projects deemed it easier to secure special legislation than to adapt their plans to the general laws.

The census report shows that there are many shades of difference between the drainage laws of the various States, but that there are, in general, two principal types of organization: (1) The corporate district, which is organized by the land owners under public supervision; and (2) the county drain, which is established and constructed as any other local improvement, and managed by county officials.

On January 1, 1920, drainage districts and county drains represented 96 per cent of all the land included in organized drainage enterprises. A part of the remaining land was served by township drains, which are similar to county drains except that they are controlled by township officials; and a part by State drains, which are controlled by States officials.

It is almost universally true, therefore, that the cost of drainage is met by assessments against the land benefited. Usually the laws provide that districts may be organized only when the benefits will exceed the cost. Both cost and benefits are estimated, and usually there is a tendency to underestimate cost and over-estimate benefits, but generally benefits have exceeded costs.

The census report referred to gives the areas included in all organized drainage enterprises in 1920 as shown in Table 9.

[8] Reports of Fourteenth Census of the United States, Vol. VII, p. 354.

TABLE 9.—*Area in organized drainage enterprises in the United States, in 1920.*

	Acres.
Area in operating enterprises:	
With works completed	56,763,751
With works under construction	8,731,287
Total	65,495,038
Area in nonoperating enterprsises in process of organization	3,924,821
Area in all organized enterprises	69,419,859

Organization of drainage districts began before the middle of the last century, but about two-thirds of the land in organized enterprises is in districts organized since 1905, and nearly half of it in districts organized since 1910.

As is the case with irrigation districts, there are two general classes of districts, considering them from the standpoint of the purpose of their organization—those organized to improve land already in farms, or for the extension of existing farms, where no settlement problems are involved, and those organized to drain swamps not previously used for agriculture, where the utilization of the land involves settlement. The census data are not classified in this way, but the figures showing the areas of improved and unimproved land in drainage enterprises indicate in a general way where districts of the two classes are located and the extent to which the drained lands have been put to use. These figures, by geographic division, are presented in Table 10.

TABLE 10.—*Percentages of improved and unimproved land in drainage enterprises, by geographic divisions.*

[See Vol. VII, p. 375.]

Division.	Total area.	Improved land.		Unimproved land.			
				Timber and cut-over land.		Other unimproved land.	
		Area.	Percentage of total.	Area.	Percentage of total.	Area.	Percentage of total.
Operating enterprises:	*Acres.*	*Acres.*		*Acres.*		*Acres.*	
East North Central	31,627,176	25,282,065	79.9	4,457,151	14.1	1,887,960	6.0
West North Central	19,217,367	11,630,279	60.5	2,530,012	13.2	5,057,076	26.3
South Atlantic	2,385,384	388,345	16.3	862,334	36.1	1,134,705	47.6
East South Central	2,323,595	1,349,791	58.1	914,404	39.3	59,400	2.6
West South Central	7,924,197	3,877,166	48.9	2,506,431	31.6	1,540,600	19.5
Mountain	810,076	635,868	78.5	87	.0	174,121	21.5
Pacific	1,207,243	1,124,721	93.2	13,113	1.1	69,409	5.7
Total	65,495,038	44,288,235	67.6	11,283,532	17.2	9,923,271	15.2
Nonoperating enterprises:							
East North Central	446,558	270,083	60.5	77,653	17.4	98,822	22.1
West North Central	718,744	406,744	56.6	89,443	12.4	222,557	31.0
South Atlantic	1,051,503	36,800	3.5	314,640	29.9	700,063	66.6
East South Central	473,235	198,494	41.9	223,185	47.2	51,556	10.9
West South Central	1,138,283	398,471	35.0	587,147	51.6	152,665	13.4
Mountain	78,733	56,729	72.0	1,950	2.5	20,054	25.5
Pacific	17,765	9,174	51.6	----------	----------	8,591	48.4
Total	3,924,821	1,376,495	35.1	1,294,018	33.0	1,254,308	31.9
Total for States included	69,419,859	45,664,730	65.8	12,577,550	18.1	11,177,579	16.1

Table 10 shows that in the West—the Pacific and Mountain States—and in the East North Central States, a very large part of the land in organized-drainage enterprises is improved and, therefore, the districts in those States do not involve land settlement. In the South Central and the West North Central States the lands in districts are about evenly divided between improved and unimproved land. In the South Atlantic States—North Carolina, South Carolina, Georgia, and Florida—the other extreme is found. Only 16.3 per cent of the land in operating districts, and only 3.5 per cent of the land in non-operating districts, is improved, and reclamation is closely connected with the problem of land settlement. A very small part of the land is producing the means of meeting the cost of reclamation, and payments of interest and principal must be met from other sources or become in default unless settlement is effected. In the States last mentioned, as well as in some other States, there are many districts where the promoters are carrying these payments and accepting the losses, while waiting for settlers. However, default on payments is not very general.

Summary of acreage reclaimed under the various acts.—The results accomplished under the various acts are shown in Table 11.

TABLE 11.—*Areas reclaimed under Federal and State reclamation acts.*

	Acres.
Desert land act:	
Original entries to June 30, 1922	[1] 32, 378, 883
Final entries to June 30, 1922	[1] 8, 312, 272
Carey Act:	
Applied for, to June 30, 1922	[1] 8, 340, 193
Segregated, to June 30, 1922	[1] 3, 813, 991
Patented, to June 30, 1922	[1] 1, 018, 131
Included in enterprise, 1920	[2] 1, 188, 937
Enterprises were capable of irrigating in 1920	[2] 804, 298
Irrigated in 1919	[2] 523, 929
United States Reclamation act:	
Included in enterprises, 1920	[2] 2, 627, 176
Enterprises were capable of irrigating in 1920	[2] 1, 680, 643
Irrigated in 1919	[2] 1, 254, 569
Irrigation districts:	
Included in enterprises, 1920	[2] 3, 432, 109
Enterprises were capable of irrigating in 1920	[2] 2, 531, 425
Irrigated in 1919	[2] 1, 822, 887
All other irrigation:	
Included in enterprises, 1920	[2] 28, 642, 599
Enterprises were capable of irrigating in 1920	[2] 21, 004, 111
Irrigated in 1919	[2] 15, 590, 331
Drainage districts:	
Included in districts, 1920	[2] 69, 419, 859
Improved land in districts, 1920	[2] 45, 664, 730
Timber and cut-over land in districts, 1920	[2] 12, 577, 550
Other unimproved land in districts, 1920	[2] 11, 177, 579
California State land settlements:	
Area included (approximately)	15, 000
Area in farms sold to July 1923 (approximately)	11, 500

[1] Report of Commissioner of General Land Office for year ended June 30, 1922.
[2] Report of the Fourteenth Census.

The area reported under the desert land act is included in the other classes, principally in "all other irrigation;" hence, should not be included in a total. Totaling the census classes gives the result for irrigation shown in Table 12.

TABLE 12.—*Area included in irrigation enterprises, 1920.*

	Acres.
Included in enterprises in 1920	35, 890, 821
Enterprises were capable of irrigating in 1920	26, 020, 477
Irrigated in 1919	19, 191, 716

The census figures given above for both irrigation and drainage indicate in a general way the areas in enterprises in the census year that had not at that time been put to use to be as shown in Table 13. A small part of the areas reported is in the incomplete projects.

TABLE 13.—*Areas in irrigation and drainage enterprises in 1920 that were not in use.*

	Acres.
Excess of area in irrigation enterprises over area irrigated in 1919	16,699,105
Excess in area in drainage enterprises over area improved land in drainage enterprises	23,755,129
Total	40,454,234

The increase in the area irrigated in the United States between 1909 and 1919 was 4,758,431 acres. At this rate of increase the area in irrigation enterprises in 1920 in excess of that irrigated in 1919 would take care of the increase for 35 years; and the area to which enterprises were capable of supplying water in 1920 in excess of the area irrigated in 1919 would take care of the increase for more than 14 years. Drainage was not included in any census prior to 1920, and it is not possible to determine the rate at which drained land has been put to use. While figures are not available for making such a definite statement regarding drainage as that made regarding irrigation, general studies made in 1923 show a great many districts in which the drains have been dug where little or none of the land has been put to use. This study seems to justify the opinion that the land for which the main drains are already installed will provide for the normal rate of expansion in the area of drained land for as long a period as the existing irrigation enterprises will provide for expansion in that field.

In either field, in a time of normal expansion, construction must be somewhat ahead of utilization, but the present margin is too wide. Assuming that the figures given for irrigation correctly represent the situation with regard to arid land, they mean that investments are made many years before the works built are put to use, and during that period are unproductive, and interest and upkeep pile up to such an extent as to cripple the investors, unless they are Government agencies with the public to absorb the losses. The experience of the Federal Government in this regard has been shown in detail in the preceding pages. Such exact data for the experience of other agencies are not available, but, in general, they are the same. The report of the thirteenth census showed that substantially the same situation existed in 1910.

No census prior to 1910 included data comparable to those given. It is believed, however, that the situation that existed in 1910 and 1920 is normal; that is, that there is a tendency to overdevelop or rather to develop too long in advance of the effective demand for the land, and that this is the principal cause of the almost universal financial failure of recent reclamation work. This tendency arises from the natural desire of every community to have its waste lands developed, and from the prevailing systems of financing the work. Under all the plans for reclaiming land on a large scale the money is to be obtained outside the community where the land is situated.

Under those conditions the benefits, without the burdens, accrue to the community; and the losses, in case of failure, fall on the outside investors. Under the Carey Act, and with irrigation and drainage districts, bonds are sold. These are based on the lands, but in fact depend for their value upon the successful settlement and cultivation of the land. Under the reclamation act, the funds are supplied by the Federal Government, and their return, in this case also, depends upon settlement and cultivation.

In every case, local interests gain from the expenditure for reclamation and whatever settlement takes place, without suffering from the loss to investors. Consequently, there is not sufficient relation between the demand for further reclamation work and the need for the land reclaimed for the growing of crops or the prospects for success on the part of those supplying the funds.

Attention has been called to the large area of "reclaimed" land that had not been put to use, and to the fact that this area for irrigation is sufficient to care for expansion in the area of reclaimed land put to use, at the average annual rate for the 10 years from 1909 to 1919, for about 14 years; and that there is included in existing reclamation projects sufficient land not yet fully reclaimed to care for expansion at the average rate for an additional period of 21 years.

The census figures indicate, however, that the rate of increase in area used has been decreasing. No figures for the increase in use of drained land are available. The average annual increase in irrigated area between 1909 and 1919—475,843 acres—was but 71 per cent of the average annual increase between 1899 and 1909—668,882 acres. Annual figures are not available except for the United States Reclamation Service. The increases in area irrigated by that service from 1913 to 1922 are given in Table 14.

TABLE 14.—*Annual increase in area irrigated in United States Reclamation Service projects, 1913 to 1922.*[1]

Year.	Area irrigated (acres).	Increase over preceding year (acres).	Year.	Area irrigated (acres).	Increase over preceding year (acres).
1913	694,142		1918	1,119,566	92,903
1914	761,271	67,129	1919	1,187,255	67,689
1915	814,906	53,635	1920	1,225,480	38,225
1916	922,821	107,915	1921	1,227,500	2,020
1917	1,026,663	103,842	1922	[2] 1,202,130	−25,370

[1] Twenty-first Annual Report, p. 2.
[2] Twenty-second Annual Report, p. 1.

It will be noted that the annual increase decreased from about 108,000 acres in 1916 to about 2,000 in 1921, and that 1922 showed an actual decrease of more than 25,000 as compared with 1921. Throughout this period the unirrigated area for which water was available on United States reclamation projects was nearly a half million acres, so that lack of expansion was not due to lack of land ready for use. If the tendency toward gradual decrease in the annual increase in the area irrigated, as shown by the United States reclamation projects, may be regarded as typical, and should con-

tinue, the area now "reclaimed" but not used will supply the demand for new land of this kind for a much longer period than is indicated above.

No doubt the very marked decline in the rate of increase in acreage irrigated during the few years just passed is due in part to the general depression in agriculture that not only has checked expansion, but has brought about demands for reduction in acreage in crops in this country. So long as the depression lasts, there is no reason to expect a revival in the demand for reclaimed land. However, the depression has merely intensified a tendency already existing. The census figures indicate that the rate of increase began declining long before the recent depression, while the Reclamation Service figures show an increasingly rapid decline during the boom years from 1916 to 1921.

The probable explanation of the long-time decline is the increasing cost of reclamation work. The report of the fourteenth census shows the average cost per acre for irrigation works to have been as shown in Table 15 for the census years for which this item has been reported.

TABLE 15.—*Average cost per acre for irrigation works.*

Year.	Cost.	Percentage of increase over the preceding census year.	Percentage of increase over average for 1890.
1890	$7.96		
1900	9.04	13.6	13.6
1910	15.85	75.3	99.1
1920	26.81	69.1	236.8

The figures given in Table 15 do not correctly represent the increased cost of new construction because the data on which each average is based includes the data on which the preceding averages are based. The correct showing for increased cost is obtained by making averages based on increased acreage and increased cost. Averages made in this way are given in Table 16.

TABLE 16.—*Average cost per acre for irrigation of land brought under irrigation in each decade covered by the census.*

Year.	Area on which average is based.		Cost on which average is based.		Average cost per acre.		
	Acres.	Increase over preceding area.	Amount.	Increase over preceding amount.	Cost per acre for increased area.	Per cent of increase over preceding decade.	Per cent increase over 1890.
1890	3,715,758		$29,533,921		[1] $7.95		
1900	7,744,467	4,028,709	70,010,594	$40,476,673	10.05	26.4	26.4
1910	20,285,403	12,540,936	321,454,008	251,443,414	20.05	99.7	152.2
1920	26,020,477	5,735,074	697,657,328	376,203,320	65.60	226.7	725.2

[1] Average for all land irrigated to 1890.

It appears from these figures that the average cost per acre for a water supply for irrigation during the last decade has been more than three times what it was in the preceding decade and more than eight times as great as it was before 1890. This very rapid rise in the cost of a water supply undoubtedly accounts, to a considerable extent, for the decided slowing up in the rate of expansion in irrigated area.

In general, future reclamation of arid land will be increasingly difficult because the more easily-constructed projects are already developed, and, therefore, it will be increasingly expensive unless increased difficulty is offset by decreases in wages and cost of materials. Since there are several alternative means by which increased agricultural products may be obtained, increased cost of reclamation may tend to force development into other directions.

Furthermore, the cost of agricultural production on reclaimed land is not limited to the cost of reclamation works, but includes the cost of establishing new farms, as well as the cost of all community improvements and institutions, such as railways, highways, schools, churches, etc. These elements of cost have not always been adequately considered in advance. It is not uncommon to see comparisons between cost of reclamation works and land values or gross crop values, with the implication, if not the statement, that these values can be credited to reclamation alone, and that the difference is a measure of the profit of reclamation.

This fallacy has been responsible for much of the reclamation activity of the past. The wide margin between the value of desert or swamp land and that of highly improved reclaimed land when compared to the cost of a water supply or of drainage canals has made it appear that there was possibility of large profit in the financing of reclamation work which usually did not exist, because the cost of reclamation was but one item and not always the largest one, to be charged against the value of the improved land. This apparent possibility for profit has been used as a lure for investors in irrigation securities, and has been urged in Congress and in the press as an argument for Government participation in reclamation. Yet the fallacy seems too apparent to need statement.

Not only does the creation of an improved irrigated farm involve many expenditures other than those incident to providing a water supply, but it involves the passage of much time, during which upkeep and interest eat into what might have been available for profit.

The extent of the delay in utilizing irrigation works to their full estimated capacity has been determined roughly from the census returns for 1910 and 1920. The schedules from irrigation enterprises were grouped by the dates of beginning and the "ages" determined by the differences between the dates of the beginning and the census year. For each age group the ratio between the acreage in the projects and the acreage irrigated in the Census year was computed. Curves based on the results are presented in Figure 1. For the census of 1910 this tabulation was not made by the Census Bureau, but was made by the writer from the census schedules. Only projects containing 5,000 acres or more were included in the 1910 tabulation. The results, and the curves based on them, were pub-

lished in the Engineering News of August 3, 1916. The projects in each age group were separated into three size groups and a curve was drawn for all projects included, taken as a whole, and one for each of the size groups. The curves for the 1910 census are reproduced from those presented in the article.

For the census of 1920 all projects, regardless of size, were tabulated by the Census Bureau in age groups, and the results are represented by the broken-line curve on Figure 1.

The curves from the two censuses are not strictly comparable because those for 1909–10 are based on only those projects containing 5,000 acres or more, which represent approximately half the acreage irrigated, while that for 1919–20 is based on all projects.

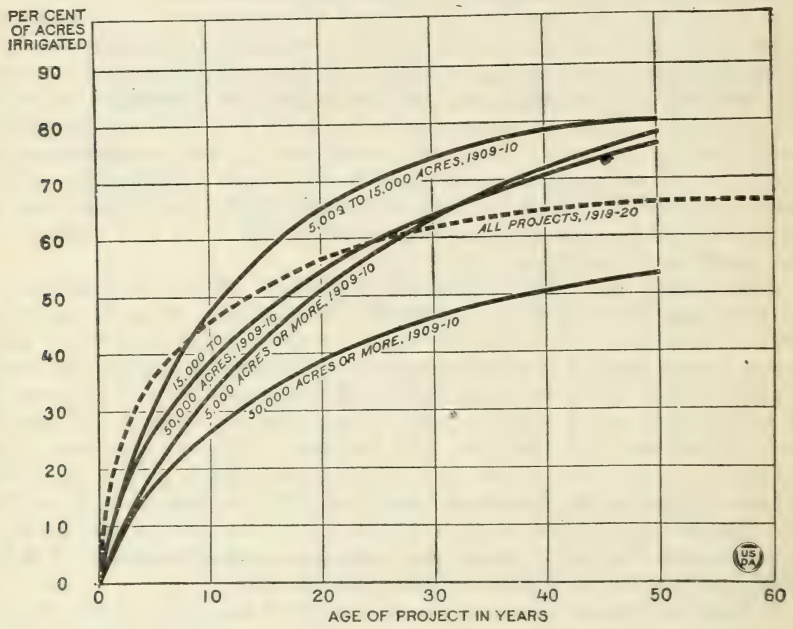

FIG. 1.—Rate at which land in irrigation enterprises has been put under cultivation. (Based on returns to Thirteenth and Fourteenth Censuses.)

Inclusion of the small projects has raised the curve for 1919–20 above those for 1909–10 for the projects of recent date; while it has lowered it for the older projects. The latter condition may be accounted for by the fact that a great many old ditches were not used in 1919, in some sections because of lack of water, and in other sections because of abnormal rainfall.

The base for the percentages on which the curves are based is the acreage reported as in projects. This figure, in the case of most projects, represents the hopes of promoters or owners, rather than the area which can be supplied by them, but usually it serves as a basis for estimating possible returns and for determining the average cost per acre, and consequently the price to be charged per acre for water rights. As a consequence, the curves indicate the extent to which the land over which the cost is spread is producing something with which to meet that cost at various periods after construction.

Up to 35 or 40 years the curve for all projects included for 1909–10 and that for 1919–20 do not differ more widely than would be expected, considering the difference in the data on which they are based. It seems likely, therefore, that the curve for 1919–20 is a fairly correct index of the experience of irrigation projects large and small. The percentages representing the extent to which irrigation enterprises are in use at 5-year intervals from the date of beginning, read from the 1919–20 curve, are as shown in Table 17.

TABLE 17.—*Extent to which the estimated full capacity of irrigation enterprises is utilized at various periods after construction begins.*

	Per cent.		Per cent.
Five years	36	Twenty-five years	60
Ten years	45	Thirty years	62
Fifteen years	52	Thirty-five years	63
Twenty years	56	Forty years	65

The curves for 1909–10 show, as is to be expected, that the rate of utilization is much higher for the small projects than for the large ones.

The curves show plainly the immediate cause for the financial failure of irrigation enterprises—the very low rate at which the land included is brought into production. The figures given on pages 27 and 28 show the same wide difference between land in projects and the acreage irrigated. The figures and the curves taken together show that the unused land is distributed through projects generally and not concentrated in certain projects that are largely unused. The most obvious conclusion is that reclamation works are overdeveloped, and the equally obvious remedy is to limit new construction to the effective demand for new land. But the fact that the experience has been so universal and so long continued indicates that overdevelopment is not the only cause for failure.

In the very nature of the case, construction must precede settlement and use. Farmers can not maintain themselves on the land until it is reclaimed. The development of farms and farmers is a gradual, time-consuming process and the heavy expenditures for reclamation in advance of possible use make the holding of land not in use a practical impossibility, for the farmer, if he is to meet his payments for the cost of reclamation, and for the investor if the farmer does not make his payments.

The real problem in reclamation work is bringing the land into use promptly enough to prevent financial failure caused by heavy carrying costs chargeable to land that is not producing. The difficulty of accomplishing this increases with increased cost and with the size of enterprises, and, of course, with overdevelopment. Various methods of solving this problem have been attempted.

Private enterprises operating under various State and Federal laws have attempted to solve the problem by extensive advertising and high-pressure sales methods generally, but these have failed because they aggravate the trouble by increasing the cost, and be-

cause they do not touch the larger part of the problem, which relates to the development of the farms. They merely bring about sales; they do not provide the means for making payments.

Some land-developing agencies attempt to solve the problem by contracting to develop farms for purchasers while the purchasers remain in other occupations and there earn the means of carrying the load. This shifts the load, but it does not solve the problem, and has not had any considerable effect in bringing success to reclamation enterprises.

The United States reclamation act attempts to solve the problem by relieving the land from the burden of interest on deferred payments, and by deferring payments for longer and longer periods, that is, by transferring a part of the burden from the settler on Reclamation Service projects to the general public. This, again, is a mere shifting of the part of the burden represented by interest, and takes no account of other charges against the land, which seem to be too heavy for the settlers to carry, even when relieved of interest.

The State of California has attacked the problem from another angle. It does not attempt to lighten the burden, nor to shift it, but rather to put the land and the farmer in position to carry it. It bases its action on the theory that land is not put into use promptly because of lack of capital and lack of experience on the part of settlers; it supplies the capital and attempts to make up for the lack of experience. Payment for the land and the reclamation works is spread over a long period of years, and funds for improvements and equipment are furnished. The experience that the settlers lack is provided for in a measure by the employment of expert advisers at the expense of the settlers and by requiring settlers to farm in a manner approved by the authorities.

The California settlements are still in the experimental stages, but their experience (see p. 20) shows certain things. On the first project, which is the smaller, and was begun when there was a real demand for land, the entire acreage was brought into production within five years. On the second project, which was larger, and was undertaken when the demand for land had slackened, the farms are not being taken so promptly, although they have been sold much more rapidly than on reclamation projects generally. The very brief California experience seems to indicate that providing capital for farm development aids very greatly in bringing the land into use promptly, but that this will not be effective if reclamation works are over-built to any considerable extent. The general agricultural situation has been such that no conclusions should be drawn from the financial experience of the settlers on the State projects.

THE FUTURE OF RECLAMATION.

Economists have given a great deal of attention to the probable future pressure of population on the supply of land available for production of crops, livestock and timber.* Their conclusions as to

*The Utilization of our Lands for Crops, Pastures, and Forests, Yearbook, 1923, United States Department of Agriculture.

the time when this pressure will become acute differ widely, but all agree that the time will come when it will be necessary to bring to its highest use all our land that now produces little or nothing.

On the other hand, there is rather general agreement that under the stimulus of war prices, and the large demand created by the temporary decline of European agriculture during the World War, our agriculture has been over-developed and the immediate problem is to adjust production to decreased demand rather than to expand it to meet increasing demand. For the immedate future, therefore, there is no national need for reclaiming more land. This does not mean, necessarily, that all reclamation work should stop, but it does mean that the general policy for the immediate future should be the cessation of the undertaking of new enterprises, unless some strong reasons for departure from this general policy are shown.

When the demand for agricultural products shall be such that it is necessary to produce more, it will be possible to meet the need by (1) obtaining larger yields from lands already growing crops by larger application of fertilizer and labor, the use of improved varieties, etc.; (2) using for crops land now producing little or nothing, but not needing reclamation, in the sense in which that term is used in this discussion; and (3) reclaiming more land. Considered purely from a food standpoint it is a matter of indifference which process is used, and that one should be used which is most economical under conditions existing at the time. It is undoubtedly true that, if it is not interfered with by artificial stimulation in any direction, development will take all of these directions simultaneously.

With reference to reclaiming more land, the following courses suggest themselves: (1) Leave development to private agencies or to semipublic agencies, such as irrigation, drainage, and reclamation districts, as is now done under the Carey Act and the Federal irrigation district act; (2) continue subsidized development, as under the existing reclamation act; (3) adopt a Government reclamation plan devoid of subsidy; or (4) continue with our present or a modified Government plan, while encouraging private and semipublic agencies.

The first questions involved in determining on future Government policies are the necessity for or the wisdom of a subsidy to land reclamation, and what kind of a subsidy should be provided if any.

It has been stated that considered strictly from the standpoint of obtaining a food supply, it is a matter of indifference whether we get it from reclaimed land or elsewhere. From that standpoint there is no reason to subsidize one method of obtaining food rather than another. That is, the subsidy, if there should be one, should be for the production of food by any means and not for its production by a particular means.

A shortage may exist in food supply generally or in the supply of some one commodity. If it is deemed advisable to subsidize the production of some one commodity, and reclaimed land is particularly adapted to the production of that commodity, the subsidy might take the form of a public contribution to the cost of land reclamation. To this time, however, reclaimed lands have not been devoted to crops not grown on other land, but rather to the crops grown generally throughout the country. The report of the census

of 1920 shows that of the total acreage of irrigated crops reported 31 per cent was in cereals, 53 per cent was in hay and forage crops, 2 per cent was in vegetables, 6 per cent was in orchard fruits, 4 per cent was in sugar beets, and 2 per cent in cotton. Of the total acreage of drained land, 79 per cent reported cereals as the principal crop, 6 per cent hay and forage, 6 per cent cotton, 4 per cent sugar, with the remainder distributed among many crops.

Another condition that might justify a subsidy would be the existence of resources that would remain undeveloped except for the local production of a food supply or raw materials. At one time this condition existed in the West, but it does not now exist. Practically every section of the West now produces so much that it is necessary to find markets for its products outside of that region. In the early years of the reclamation of our arid lands the farmers used a cheap water supply to produce for a high-priced local market; in recent years they use a high-priced water supply to produce for distant markets where they must compete with supplies grown without irrigation. The same condition exists in the regions in which the large areas of unreclaimed wet lands are situated. Crops grown on reclaimed lands would have to seek markets elsewhere, rather than supply a local need. It does not appear that the production of local food supplies to make possible the development of other industries justifies a subsidy to reclamation.

The compelling reasons for reclamation in the past have been: (1) The apparent opportunity for profit in supplying water for irrigation or in selling reclaimed land; and (2) local desire for the development of the community, even if the direct returns are not sufficient to justify the cost of reclamation, the argument being that the "creation of taxable values" and the general benefit to the community were sufficient to justify a subsidy. If a subsidy is granted on these grounds, it seems evident that those who reap the benefit should pay the subsidy. The political subdivisions that levy on the taxable values created should pay the subsidy if it is justified on this ground; and local urban property should contribute if the upbuilding of the local communities is the object of land reclamation in their vicinity. The reasons just discussed can not justify a national subsidy. If there is to be one it should be local.

Federal aid in reclamation has been compared to Federal aid to farmers under the various rural credits acts. There is, however, the wide distinction that there is no subsidy in the farm loan act. Funds are obtained by the sale of bonds, and borrowers of these funds pay a sufficient rate of interest to pay the interest on these bonds and to meet operating expenses; while under the reclamation law, interest on the funds which go into the reclamation fund is not considered as a cost, and no interest is charged on deferred payments to be made by the water users. To be sure, the reclamation fund is made up from the receipts of the United States from various sources, and those particular funds are not borrowed on interest; but so long as the Federal Government has borrowed large sums, interest on borrowed funds is, in fact, a cost for this work. To make an advance of funds for the construction of reclamation works comparable to a farm loan, interest on the investment must be considered a part of cost, and interest must be charged on deferred payments at a

rate sufficient to cover the interest paid by the Government and the cost of administering the bureau.

If Federal aid to reclamation is placed on that basis, it will no longer involve a subsidy and can be justified on the ground that it is, in effect, a loan for land improvement, like any loan made by a farm loan bank. There would still be a question of the wisdom of making advances for this purpose at this time, and the question of security for the advances made.

As to the wisdom of making advances for land reclamation at a time when there is already an overproduction of farm products there would seem to be considerable doubt. If it is the duty of the Government to encourage agricultural production when it is not supplying our needs, it should, equally, be its duty to discourage it when there is overproduction.

As to security for advances for reclamation as compared with the security for farm loans: The farm-loan bankers loan not to exceed 50 per cent of very conservative valuations of the land and 20 per cent of the insured value of the improvements on which the loans are made; while in land reclamation the advances are, in many cases, many times the value of the land on which the improvements are made, and the real security for the advances is the future production from the land reclaimed. In other words, advances on farm loans are highly conservative investments, while advances for reclamation are highly speculative investments. In fact, the reason for Government adances for this work has been the fact that it was difficult to get private parties to take the risks involved in such investments. If advances made are not repaid the result is a subsidy just as truly as if there had been no agreement to repay. If there were a shortage of agricultural products the Government might take these risks—or grant a subsidy—for the sake of overcoming the shortage, but when there is no shortage there does not seem to be any good reason for doing so. When there is a shortage there is a tendency for prices to be so high that there will be no necessity for Government aid either with an actual subsidy or with low rates of interest and easy terms. Under a Government reclamation scheme without subsidy there would be no difficulty in obtaining funds. This, however, is not an unmixed blessing. Under private initiative difficulty in obtaining funds decreases as the need for the work increases and vice versa. There is an organic connection between the two. On the other hand, the demand for Government aid increases as the need decreases. That is, the demand for Government construction comes when it appears that it will not pay anyone else to do it.

Government construction might make possible the carrying out of a national policy for the selection of the land that should be reclaimed, and prevent the attempt to farm lands that should not be farmed; but the Government is, in fact, subject to political pressure, by local interests concerned with reclamation, and it is difficult to withstand this pressure.

Government reclamation work probably would assure adequate water supply and honest construction, which have not always been assured under private enterprises developed for profit. This assurance should help to bring about prompt settlement and use of the reclaimed land, and that Government participation is an influence

in this direction is indicated by the census reports, which show that on the United States reclamation projects the degree to which the works are utilized is greater than on projects of any other kind except cooperative enterprises.

The most recent proposals for governmental participation in reclamation have proposed Government financing and construction, without a subsidy, which amounts to the loan of Federal credit for financing, plus Federal construction (see p. 23). The States, on the other hand, are tending toward the policy of lending their credit, without provision for State construction. It is believed that if there is a loan of public credit, it should be accompanied by either public construction and expenditures or a very high degree of public supervision of construction and expenditures, to insure that the funds are expended properly. As between the two, public construction affords the greater security for proper expenditure.

Proper expenditure alone will not insure against loss of the funds advanced for construction. Their return depends more largely upon prompt settlement and use of the land reclaimed, and the approval of any project should depend upon evidence that the land reclaimed will be put to use promptly. If there is to be no subsidy there must be prompt payment, and this can not be, if the land is not producing.

The demand for Government reclamation undoubtedly is due partly to the fact that it involves the subsidy and the indefinite postponement of payments of construction cost. With the subsidy eliminated the demand would be less, except as the hope of leniency in enforcing payment forecasts a subsidy that nominally does not exist.

The advantages of Government reclamation work may be summed up as follows:

It makes possible the selection of areas to be reclaimed, in accordance with an established policy of expansion of the agricultural area.

It makes possible the obtaining of funds at low rates of interest, and thus decreases the cost of reclamation.

It gives assurance as to the sufficiency of water supply, stability of reclamation works, and ability to carry out any contracts made.

It assures leniency in collections in case of adversity, an advantage not unmixed with disadvantages.

The principal disadvantages lie in the possibility of the perversion of the advantages just enumerated, as follows:

The selection of areas to be reclaimed is likely to be governed by political considerations resulting from pressure by the local land-owning and business interests directly benefitted by expenditure of the funds.

The demand for Government expenditures for reclamation has little relation to the real need for the land to be reclaimed.

The ease of obtaining funds is likely to lead to reclamation work when and where it is not needed.

There are likely to be demands for leniency in collecting, when there is no valid reason for it.

There is a tendency toward extravagant or unnecessary expenditure, because of the lack of incentive for economy in construction as a means of obtaining profits.

Up to the present time the disadvantages have been much more in evidence than the advantages, due in part, no doubt, to the subsidy feature of the present system. It is probable that the objectionable features would be greatly decreased if the subsidy were eliminated.

The wisdom of adopting a Government scheme of reclamation devoid of subsidy for the future will depend very largely upon the

extent to which private enterprise responds to the needs of greater agricultural production without this aid, and the extent to which it is possible to avoid the disadvantages or evils.

Any scheme that may be adopted should go farther than the present system, and should include some provision for bringing the land into use promptly. Probably this should take the form of including a considerable part of the preparation of the land for use as original construction, and the provision of liberal credit for improvements and equipment. This will involve larger expenditures, and will increase the necessity for guarding against the evils discussed, and for public supervision of the activities of settlers until a considerable part of their indebtedness is discharged. It is preferable also that arrangements for ensuring a reasonable sale price of the land reclaimed and the careful selection of settlers should be made a point of the policy.

Aside from Government construction, the greatest activity in irrigation reclamation is shown by irrigation districts. The States have a practical veto on such activity through their power to supervise organization, and their provisions for certifying bonds. When a State has certified bonds it has assumed a certain moral obligation to the purchasers of those bonds, although it is under no legal obligation to make the bonds good.

Under these circumstances the States may well insist that districts shall provide conditions that will bring the lands into use promptly and thus insure, or at least create a strong probability, that interest and principal will be met promptly. This will involve the amendment of State laws in such a way as to make it possible for districts to bring the land into condition for use, and, perhaps, provide some of the credit needed for improvements and equipment. At least, the States should have authority to require that such credit be available before approving organization or certifying bonds.

If the States or the Federal Government go farther than they have done, and guarantee district bonds or issue their own bonds and advance the funds for reclamation work, there will exist still stronger reasons for such provisions as have been mentioned, and also for rigid public supervision of construction and operation, or possibly public construction and operation during the development period.

With public financing, whether construction is done directly by public agencies or under public supervision, there is the same danger of overbuilding that has been discussed in reference to Government construction. Uusually those who urge construction are not those who will have to pay the cost.

A considerable part of the development of the past has been promoted by private enterprises that sold stock and bonds to one set of individuals and sold land and water rights to another set, leaving to the first group the burden of collecting from the second group, without much care as to the success of either group. There should be such public supervision of private enterprise that purchasers of securities will have reasonable assurance of payment; and that purchasers of land will have assurance of a water supply or adequate drainage, as the case may be, of good land, and generally a reasonable chance of success. Private initiative should be given the freest possi-

ble chance, as it is most likely to be sensitive to the real need for new development, but the public should be carefully guarded against fraud and misrepresentation.

CONCLUSIONS.

There is no justification for a national subsidy to land reclamation. If local interests justify the subsidizing of land reclamation, the subsidy should be local.

If it becomes desirable for the nation to subsidize agricultural production the subsidy should apply to agricultural production generally, not to one type of expansion alone.

Land reclamation is a form of agricultural improvement, and any reasons that justify public aid in financing other agricultural operations apply to land reclamation. Such aid should be conditioned upon the same degree of security for repayment of advances that is required in other fields.

If public aid is employed in financing reclamation there must be a high degree of public supervision of construction and operation during the development period, or actual public construction and operation.

Public financing makes possible public control of the selection of land to be reclaimed and of the rate of reclamation, but there goes with this the possibility of both the rate and the location being controlled by political rather than economic considerations.

There should be sufficient public supervision of private enterprise to prevent misrepresentation or fraud in the sale of both securities and lands.

The chances of financial success of both public and private enterprises will be improved by making preparation of land for immediate use a part of reclamation work and by providing capital for improvements and equipment. All these involve a high degree of supervision of agricultural operations until repayment of advances has progressed sufficiently to make the security for the balance ample.

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